CENTRAL EXPERIMENTAL FARM.

DEPARTMENT OF AGRICULTURE,

OTTAWA, - - - CANADA.

BULLETIN No. 18.

LADOGA WHEAT.

FEBRUARY, 1893.

To the Honourable the

MINISTER OF AGRICULTURE.

SIR,—I have the honour to submit for your approval Bulletin No. 18 of the Experimental Farm series, in which I have endeavoured to place before the public in an impartial manner the particulars relating to the introduction and dissemination of the Ladoga wheat, and the efforts which have been made from the outset to obtain information from those most competent to judge as to its quality and from farmers as to its earliness in ripening. I have also embodied the more recent report of Messrs. McLaughlin & Moore, of the Royal Dominion Mills, of Toronto, Ont., on the thorough test made by them to determine the relative commercial value of the flour of this variety of wheat as compared with that of the Red Fife.

I desire to acknowledge my obligations to Messrs. McLaughlin & Moore, also to Mr. J. D. Nasmith, G. Coleman and B. Woodman, who have conducted the baking tests, for the careful and painstaking manner in which the work has been carried out.

I have the honour to be,
Your obedient servant,

WM. SAUNDERS,
Director Experimental Farms.

OTTAWA, February 24, 1893.

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LADOGA WHEAT.

BY WM. SAUNDERS, *Director, Experimental Farms.*

For many years past the importance of obtaining the earliest ripening varieties of grain which the world could furnish for test in the Canadian North-West, had impressed itself on the minds of many of those who took an interest in that country. In 1882 when the late Charles Gibb, of Abbotsford, Que., visited Russia in company with Pro. J. L. Budd, of Iowa, for the purpose of inquiring into the character and hardiness of the fruits grown in the northern parts of that country, he made inquiries also regarding the early ripening varieties of wheat to be found there. Having carefully studied the character of the climate, he ascertained that the season was short and that the climatic conditions in some parts of Russia closely resemble those which obtain in districts in the North-West Territories of Canada, and finding that some of the wheats in cultivation there ripened very early, he endeavoured to procure samples to bring home with him, but did not succeed in obtaining them. In conversation with him after his return, information was obtained as to the localities and sources where the most promising of the early ripening wheats would probably be found, and as soon as the experimental farm system was inaugurated, early in the winter of 1886, under instructions of the Hon. John Carling, Minister of Agriculture, correspondence was opened with a noted seed dealer in Riga, Russia, Mr. E. Goegginger, who had made a special study of Russian cereals. Samples of the best Red Fife obtainable were sent to him, and he was requested to select from the varieties grown

north of Riga, the earliest sort or sorts to be found, and if possible to secure grain equal in quality to the best Red Fife. He was also requested to interest himself in obtaining for test on the experimental farms samples of other varieties grown as far north in that country as the cultivation of wheat extended, so that opportunity might be had for testing here all the more promising sorts to be found in Northern Russia, with the hope of finding among them a hard wheat of good quality, which would ripen early enough to escape the autumn frosts, which sometimes injure the crop in some parts of the North-West country.

The variety which Mr. Goegginger recommended as most likely to meet the requirements of the case was the Ladoga, grown in latitude 60 near Lake Ladoga, north of St. Petersburg, and by latitude 600 miles north of the city of Winnipeg. This variety is said to be highly esteemed in Russia both for its quality and earliness. One hundred bushels of this wheat was ordered and received in Ottawa early in the spring of 1887, when samples were submitted to some of the leading millers and other expert judges who pronounced it to be a promising wheat which they believed would grade almost as high as No. 1 hard. The kernel was plump, longer than Red Fife but not so bright in colour and it weighed 61 lbs. per bushel. Samples of this grain weighing three lbs. each were distributed for test without delay to farmers in different parts of the Dominion, 277 of which went to Manitoba and the North-West Territories and 1,200 lbs. was forwarded by the Commissioner of Indian Affairs to be distributed among the Indian agencies.

The demand from the North-West for samples of this grain was large and it was found necessary to order another 100 bushels from Riga which was received early in the spring of 1888. 275 reports were received from farmers who had tested the Ladoga in 1887, and 301 from those who tested it in 1888, and these show that the Ladoga had ripened on the average ten days earlier than the Red Fife wherever tested. A bulletin was issued on this subject (No. 4) in March, 1888, giving particulars of such information as was obtainable regarding this wheat to that date.

In order to form a correct judgment as to the quality of this grain as grown in this country, opinions were sought from the most competent judges and boards of experts in the Dominion. The most prominent among the Dominion grain inspectors, the

largest millers, and the Boards of Trade at Montreal, Toronto and Winnipeg were all consulted. Eleven samples of Ladoga, four of which had been grown in Manitoba, four in the North-West Territories, and three in the Maritime Provinces, were selected for scrutiny. The samples sent to each were all out of the same bags, they were sent just as they were received from the growers; information was given as to the name of the variety, the names and addresses of the parties who had grown the samples, and an opinion asked for as to how these samples would grade in the markets of this country, if offered in quantity, and how they would compare in value with Red Fife. With reference to the purpose of this introduction, I quote the following from the letter which accompanied the specimens, "the object of this introduction is not by any means to displace the Red Fife. I think the growth of that variety should be encouraged in every practicable way, but the Minister of Agriculture desires that an earlier wheat of good quality should be secured to be grown where the Red Fife does not succeed, and thus discourage and prevent as far as is practicable the introduction of soft and inferior varieties of wheat, so that the present high standard of our North-West grain may be generally maintained." The opinions given on these samples—which were identically the same in each case—were most varied and conflicting. The same sample was pronounced "hard" by one board of experts, "soft" by another, "hard" by a third, but "worth 5 cents a bushel less than No. 1 hard," while a fourth judge pronounced it as "extra No. 1 hard."

Samples of the same lot were submitted for analysis to Mr. F. T. Shutt, Chemist of the Dominion Experimental Farms, and the results of his analyses published in Bulletin 4 show that the better samples of Ladoga contained as large a percentage of gluten as the best Red Fife, and the quality of a hard wheat is believed to depend mainly on the proportion of gluten it contains.

In November, 1888, sixteen bushels of Ladoga wheat which had been grown at the Experimental Farm at Indian Head were taken to the roller mill at Fort Qu'Appelle, N.W.T., with a similar quantity of Red Fife which had been grown in an adjacent field. The flour of the Ladoga, when compared with the Red Fife, was found to have a yellow shade. Several sacks of flour from both these varieties were forwarded to Ottawa, and bread carefully made

from each under my own supervision. The Ladoga was found to produce a drier flour than the Red Fife, and 100 lbs. of the Ladoga flour produced 2 lbs. more of bread than the same quantity of the other. The bread made from both samples had a yellowish tint, but the yellow colour was more pronounced in the bread made from the Ladoga flour. Samples of this bread were submitted to the members of the Committee on Agriculture of the House of Commons then in session, where they were both pronounced of good quality.

A sack of each sort of flour was sent to two of the leading bakers in Ottawa, who tested it carefully and submitted reports. One stated that the Ladoga was a stronger flour than the Red Fife and would make more bread to the barrel, but the colour of the bread made from it was not so good; the other was also of opinion that the Ladoga was the stronger flour of the two, but being darker in colour would not command so high a price as the Red Fife. Samples of bread made from the Ladoga were sent to a number of people of good judgment in Ottawa, by whom it was pronounced to be of good quality.

In summing up the evidence brought together in Bulletin 4 I used the following words, which I thought were justified by the facts presented :—"The better samples of Ladoga are fully as rich in gluten as the best Red Fife, and while the cultivation of the Red Fife should be recommended in every section of the North-West, where it is likely with early sowing to escape the autumn frosts, the growth of the Ladoga may be safely encouraged wherever the ripening of the Red Fife is uncertain, without incurring the risk of materially lowering the reputation or the general quality of Canadian hard wheats."

In the annual reports of the Experimental Farms for the years 1889, 1890 and 1891, further particulars were given of the testing of this wheat, and it is shown that the quality of early ripening has been maintained throughout. Many efforts were made during the past two years to secure a sufficient quantity of Ladoga to make a thorough test at one of the larger mills as to the quality of the flour which could be made from it, as the early tests made in a small way were held to be insufficient and unreliable. Finally Messrs. McLaughlin & Moore, of the Royal Dominion Mills, of Toronto, agreed to make a thorough test if a car load of this

wheat could be procured for the purpose. On learning that it could be got in the Prince Albert district, where some of the farmers had grown Ladoga very successfully for several years, Mr. A. Mackay, Superintendent of the Experimental Farm at Indian Head, was requested to visit that locality early in the year and purchase the necessary quantity of pure Ladoga. This reached Toronto early in April, and on the 28th of that month the grinding was begun. I was present during the greater part of the day and saw the working of the wheat and was satisfied that the test was fairly conducted.

Several of the leading bakers in Toronto were supplied with the flour and several tests were made with it, and our chemist, Mr. F. T. Shutt, was sent to Toronto to be present at some of these tests. The following report has been submitted by Mr. Shutt :—

WM. SAUNDERS, Esq.,

SIR,—I beg to report as follows regarding the Ladoga baking test conducted in Toronto last May :—

The wheat was ground by Messrs. McLaughlin & Moore, Royal Dominion Mills, Toronto. In an interview Mr. McLaughlin expressed himself respecting the milling of Ladoga and the quality of the flour in the following terms : "Compared with Red Fife it grinds 'tough,' reducing the capacity of the mill—thus the output per hour was :—

Ladoga.....	16·3 barrels.
Red Fife.....	18·1 "

These results, however, would not have been so adverse to Ladoga if the mill were run with it, say for a week. The present trial was for nine hours only. The cleaning process or separation of bran is more difficult in the case of the Ladoga, though in this respect as well as in the grinding it ranks ahead of 'goose' wheat. It would yield about the same quantity of flour per bushel as No. 1 Hard, in which also the percentages of 'Bakers' strong' and Low grade are similar to those from No. 1 Hard. It contains about the same percentage of gluten as No. 1 Hard. The flour is yellow compared with that from No. 1 Hard. Doubtless the flour would give better results after being allowed to age."

Through the courtesy of Mr. J. D. Nasmith, baking trials were made at his bakery, Adelaide Street, Toronto.

The first three experiments were conducted by Mr. Nasmith on 4th, 5th and 10th May. He found that the third trial yielded

much whiter bread than the first, owing to a modification in the method and time of working the sponge and dough. Mr. Nasmith obtained bread from Ladoga, at the third trial, which but for a slight yellow tinge he considered equal to that from "Queen" (Patent) brand. He further is of opinion that it is a strong flour, and that the yellow colour may be dissipated to a great extent by allowing fermentation to proceed longer than usual. The sponge of Ladoga works quicker than that of Red Fife. In a comparative test Mr. Nasmith obtained from 100 lbs. of "Queen" flour, 147 lbs. of bread; from 100 lbs. of "Ladoga" flour, 152 lbs. of bread.

The following trials were made under my own supervision. The weights of flour, yeast, salt and water used, as well as of the sponge, dough and bread were carefully recorded. The baker used a sufficient quantity of water, according to his own judgment, to bring the sponge and dough in each case to the right consistency; the weight of the water used being noted. The sponge in each case was set for eleven hours, the initial temperature being 76° F. The temperature of the bakehouse ranged from 70° to 72° F. throughout the night.

The "Queen" brand.—This rose well in the sponge and improved in the pans, and the bread was very satisfactory in all respects. From 100 lbs. of flour, 140 lbs. 8 oz. of bread were baked.

The Ladoga flour.—At the end of the setting period (11 hours) the sponge was much "slacker" than that of the "Queen." It had evidently been allowed to ferment too long and had become "spent." It would not "improve" or rise in the pans, and the resulting bread was yellow and "flat" compared with that from the Queen flour. From 100 lbs. of the flour 145 lbs. 13 oz. of bread were obtained.

I would very briefly sum up as follows:—

1. That it is evident that the right conditions for obtaining the best results in baking Ladoga are not as yet well understood. Good, well risen white bread has been baked from Ladoga flour which on another occasion has yielded flat, heavy, yellowish bread. The public at present demand a white bread, and it is chiefly on this account, I think, that the bakers are averse to Ladoga flour—the bread from it usually having a yellowish colour.

2. The physical character of the gluten is different from that of the Red Fife. It is somewhat inferior in colour and elasticity, and is more sticky. Age would most probably improve its quality. In percentage of gluten, however, it is fully equal to Red Fife—see Bulletin 4, Experimental Farm series.

3. The Ladoga is drier and consequently takes up more water and yields a larger weight of bread than the Red Fife flour. This I surmised from my analyses of the Red Fife and Ladoga flours given in the Bulletin above mentioned.

Your obedient servant,

FRANK T. SHUTT,

Chemist Dominion Experimental Farms.

Ottawa, January 2nd, 1893.

On the 9th of May, Mr. McLaughlin wrote as follows :—"Mr. Coleman has tried the flour, so has Mr. Nasmith, but neither have yet made tests satisfactory to themselves. So far as we have seen of the bread it looks as if the colour was going to prove very yellow and the strength better than we anticipated, but nothing positive can be said until these bakers have made satisfactory tests." On the 10th he says :—"In our yesterday's letter we said that so far as we had yet seen of the Ladoga bread it was going to prove very yellow . To-day we have samples from both bakers which are surprisingly different from the samples on which we based the "very yellow" opinion. Mr. Nasmith, I think, intends sending you some loaves of bread which if they reach you in good order, will do something to confirm your faith in Ladoga. We shall not venture any further opinion until the bakers have made their final tests." On the same day Mr. J. D. Nasmith write as follows :—"I sent you to-day by express three loaves, two from the Ladoga flour, the other one is from McLaughlin's 'Queen.' The first comparative trial a week ago was suprising, establishing strength enough, but such a very yellow colour as I never saw before in bread. To-day's sample if it reaches you in time, I know will gratify you as it did me, I did not at all anticipate such results from first trial." When this bread arrived I was absent from home and did not return for several weeks when the bread was spoilt. Those who saw it and tested it while fresh pronounced it excellent.

Nothing further was heard on this subject until 14th June, when Mr. McLaughlin wrote again as follows:—"We have now had sufficient experience of the Ladoga flour to satisfy us that it is never going to be a favourite with bakers. Nasmith has not been able to repeat the loaf he sent you, and Coleman condemns it in unstinted terms, a third man, B. Woodman of Parkdale, to whom we sent some had quite as bad an experience as Coleman. These are the only three to whom we have sent the flour. Certainly the bread– all but that one sample of Nasmiths—was unfit for Toronto trade."

Mr. McLaughlin's final report on this subject was written on the 25th August, and reads as follows:—

TORONTO, 25th August, 1892,

Prof. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

DEAR SIR,—On the 28th April last, we ground 600 bushels Ladoga wheat shipped to us from Prince Albert, N.W.T.

The wheat was in good condition, fairly plump, free from smut or frost and very uniform.

In grinding it worked quite different from ordinary Manitoba hard wheat, being harder to reduce and requiring more power. In this respect it resembled "goose" wheat more than any other variety.

We sent some of the "Patent" and some of the "Strong Bakers" flour to different bakers in Toronto, telling them what it was, and requesting them to be as careful in their baking tests as we had been in milling it.

In every test the flours were pronounced inferior to the flours from ordinary No. 1 and No. 2 hard Manitoba wheat.

In all cases the deficiency in strength, the very yellow colour, and the coarse texture of the bread were the evils complained of.

No baker who tested it could be persuaded to buy the flours afterwards, even at a considerable reduction in price from the price of flours similarly made from No. 2 hard Manitoba.

Later tests, after the flours had been six weeks old, resulted no better.

Baked as household flour, the Ladoga Patent and Strong Bakers worked fairly and made bread that was up to the quality of much that is used in some places, but not good enough for people who are particular as to appearance as well as taste.

Our different experiences with this flour lead us to this conclusion.

Good unfrosted Ladoga wheat, such as the lot we ground, will make better flour than No. 2 regular Manitoba wheat, but not as good as No. 1 regular Manitoba.

We still have some of both grades of the Ladoga flour on hand, which we would be pleased to dispose of to any one who wished to test it further.

We are yours very truly,

McLAUGHLIN & MOORE.

From the facts submitted it would appear that while it is possible to make good bread from Ladoga flour it is much easier to make bread of an inferior quality, and unless the proper methods for treating this flour to procure uniformly good results could be ascertained it is not likely that Ladoga will be acceptable either to millers or bakers, as long as the flour of the Red Fife is obtainable. Hence wherever Red Fife can be ripened, the efforts of those settlers engaged in wheat growing in the North-West should be directed to its production in the greatest perfection by early sowing and a proper preparation of the soil. It is to be regretted that the Ladoga wheat has not in quality more fully realized the hopes which were first based on it. Since Bulletin No. 4 was published it has been found that the gluten in different varieties of wheat, although responding alike to chemical tests, varies in its physical properties of toughness and elasticitity and that in these particulars, the gluten in Red Fife is superior to that in most other wheats.

The presentation of this case of the Ladoga would not however be complete without quoting from some of the letters which have been received in favour of this grain. It is undoubtedly a week or ten days earlier in ripening than Red Fife and there is no early variety among all the hard spring wheats which we have tested which has more good points than Ladoga. Some of the varieties imported from India are as early, but they are such poor yielders that no farmer would care to grow them, and no sufficient quantity has been grown here to admit of their being tested by the millers.

Many cross-bred varieties have been produced at the Central farm, between Red Fife and these early sorts with the hope of originating new wheats equal in quality to Red Fife and earlier. Until these new sorts are multiplied and their relative value ascertained, settlers in the Canadian North-West would do well to devote their attention to the growing of Red Fife, and place it under such conditions as to give it every chance of maturing since no other wheat is yet to be had which will give the same satisfactory returns, both for home and foreign trade.

As samples of testimony form settlers and others in favour of Ladoga the following are submitted and many more such might be given. Mr John Eccles of Stony Plain, Edmonton, North-West Territories, writes on March 7th, 1892, as follows: "I sowed a couple of acres of Ladoga last year on the same day as my Red Fife, and reaped it 14 days earlier. It was a splendid crop perfectly free from smut. I consider it a first class wheat, I had a grist ground at the mill, and I never want a better quality of flour, notwithstanding the reports to the contrary."

Mr. Henry H. Hayward, of Hayward, Assa., writes under date of March 26th, 1892, and says: "In the spring of 1889 I sowed a 3-lb. sample of the Ladoga wheat which you were kind enough to send me, and in the fall of last year (1891) I thrashed 174 bushels, the result of the 3-lb sample. The 19th of this month I took to the roller mills at Fort Qu'Appelle 51 bushels to be tested as to what sort of flour it would make. The amount I received in flour was 38 lbs. of the best, and about 3 lbs. of poor grade per bushel of 60 lbs. I may say that the sample of wheat was a fair one, there being no trace of smut in it. The grain was much lodged by a storm which caused great waste in harvesting, yet I thrashed 35 bushels to the acre." A sample of the flour was sent by Mr. Hayward of that part of the grist which was supposed to be perfectly pure, and it appeared to be very good, but was a little yellow in colour.

Mr. Alex. McGibbon, Inspector of Indian Agencies, writes on November 12th, 1892, from Onion Lake Reserve, 100 miles northwest of Battleford, and says: "I take the liberty of sending you a sample of Ladoga wheat grown on this Agency. It was tried for the first time this year. The Indian fields gave a return of 12 bushels per acre, but it was badly damaged by gophers, the season being very dry. Half an acre sown by the Agent in his own field,